V.E. Vatagina, V.M. Rychkova, E.E. Franyuk
Ural State Mining University
Yekaterinburg, Russia

METHODS OF FOREST FIRES MONITORING

Abstarct: The article discusses the questions of early detection of forest fires by various methods of their monitoring. Currently traditional methods of monitoring are gradually replaced by modern technologies based on automation and GIS technologies.

Key words: forest fires monitoring, forest management.

For Russia forest fires are one of the main problems damaging the economy, ecological state of regions and also threatening people's lives. Especially it is possible to single out large fires over the European territory of the Russian Federation in 2010 and over the territories of the Siberian and the Far Eastern Federal Districts in 2012. Such natural disasters have taken the scale of the national disaster for many regions and this, in its turn, induces authorities and specialists to come to the conclusions and change systemic approaches to solving such situations [1].

Fire-fighting is possible with timely assessment and effective forecasting of fire hazard indicators and the risk of firing. So the task of early detection of fires is emerging which is solved by using modern information technologies in the field of fire-fighting and preventing forest fires. One of its solutions is a ground-based monitoring which enables continuous monitoring of forest territories and identifying fires at an early stage. Such method can include: ground patrol by vehicles, observation from watch towers and the use of distributed sensor systems for monitoring. [1].

The traditional method of fire detection is based on the use of ground patrols by forest service, patrol vehicles, monitoring the forest from fire-observation towers, where an observer is located, who, through communication and optical visual control devices detects and reports to the dispatch station. The advantages include the high alerting speed in the presence of favorable weather conditions, the possibility of using infrastructure of watch towers being preserved to the present day,

simplicity and large-scale. The disadvantages are the need for continuous use of human resources at each location of watch towers during the whole period of fire season and the lack of automation of detection and alerting [2].

At present there are methods for fire detection from the air using flying machines (FM) of different classes – this is aviation monitoring. The FMs regularly fly all over the fire-dangerous territory and if the fire is visually detected its coordinates are determined and the information of the detected fire is transmitted to the control center. The main advantage of this method is the ability to monitor large areas and remote areas as well. The main disadvantage is the high cost of flying hour.

The air drones are gaining now some popularity. The use of them can slightly reduce the cost of flying hour but does not eliminate the problem of late fire detection.

The results of fires and their impact on the forest-formation process should be taken into account in forest management, accounting and forecasting of the state of forest resources. However it is difficult because of the lack of available, technically reliable and cost-effective methods for simultaneous assessment of the state and formation of forests under the influence of fires within large forest areas. One of the most promising ways to solve this problem is the use of remote methods [3].

A global approach to monitoring forest fire is the use of satellite monitoring system – these are specialized satellites that are located on non-geostationary orbits and take pictures of the Earth's surface. On the basis of the temperature difference between the Earth's surface and temperature of a fire it is possible to determine its approximate location. The picture is sent to special centers, where concerned users can receive all the data via the Internet. The advantages of this method include automation of the data obtaining process, remoteness of the method, the ability to monitor any area, easy access to information via the Internet. As disadvantages of satellite monitoring, it is necessary to note the large area of minimum detectable fire which ranges from 1 to 50 ha, the low frequency of data obtaining (several times a day) and the considerable influence of weather conditions. In conditions of windy weather, the delay (4-6 hours) of detection of even a small fire can lead to serious consequences and increase the cost of its suppression. But with all its disadvantages satellite monitoring is necessary in the case of large forest

areas and lack of monitoring by other methods. The cost of satellite monitoring is also very high [1].

The forest fire monitoring system should use a variety of information and be carried out in the form of satellite, aerial and ground subsystems for data collection and processing [4].

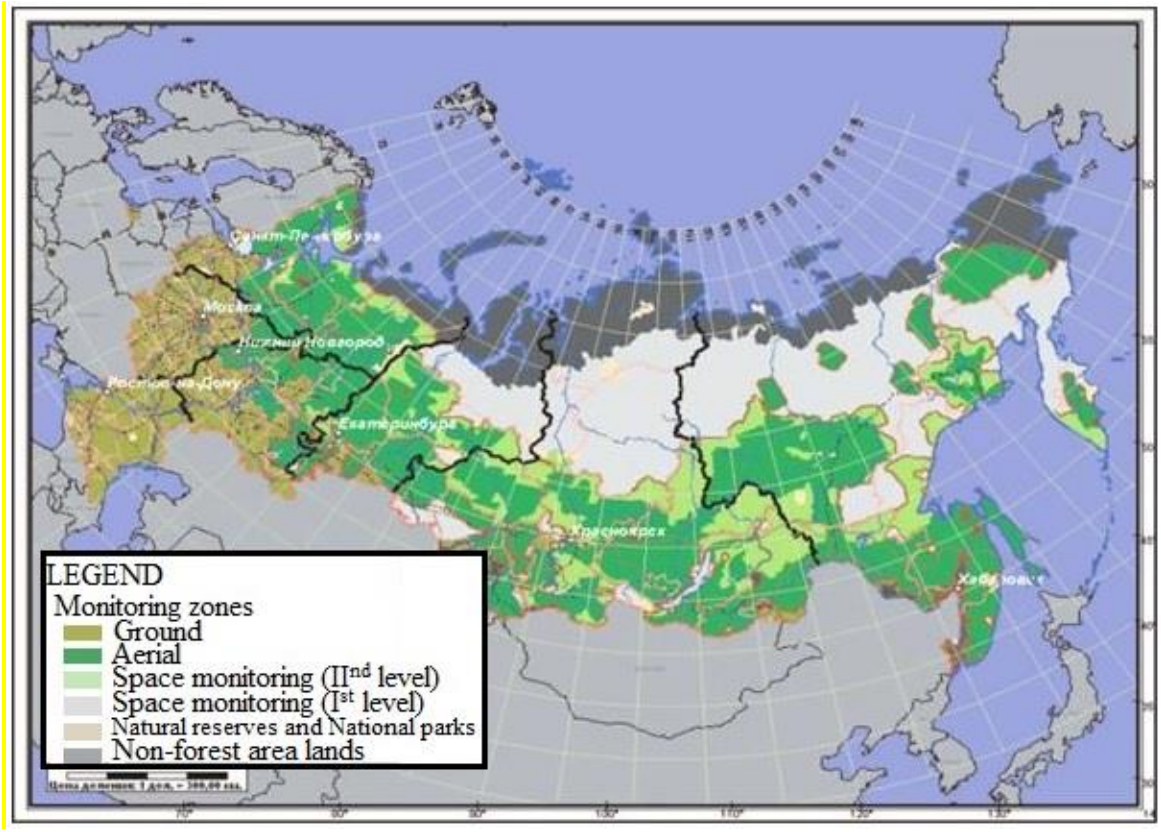

Figure 1 - Zones of forest fire monitoring

Modern technologies include video monitoring designed to detect forest fires; the first systems in Russia appeared in the early 2000s. The main feature of video monitoring is a high degree of automation and the ability to use cheap and simple watch towers. The existing systems use steerable cameras installed on towers with the video output to the console of the operator who should be near the video monitoring post. This method does not allow determining coordinates of the fire. It is also not possible to scale such a system. The advantage of video monitoring is the minimum amount of human resources involved in the monitoring process, as well as the detection of fire at fairly early stages.

The main scientific and technical task is to create a distributed video monitoring system to solve the problem of early detection of forest fires. Such a hardware-software complex will be created on the basis of modern

data networks, video monitoring and intellectual systems of machine vision [1].

В.Е. Ватагина, В.М. Рычкова, Е.Е. Франюк
Уральский государственный горный университет
Екатеринбург, Россия

СПОСОБЫ МОНИТОРИНГА ЛЕСНЫХ ПОЖАРОВ

Аннотация: раннее обнаружение лесных пожаров осуществляется различными способами их мониторинга. В настоящее время от традиционных методов мониторинга переходят к современным технологиям, которые основываются на автоматизации и ГИС-технологиях.

Ключевые слова: мониторинг лесных пожаров, ведение лесного хозяйства.

СПИСОК ЛИТЕРАТУРЫ:

1. Ipatov Yu. A. et al. Designing a distributed ground monitoring system for forest fires // Cybernetics and programming. – 2013. – No. 2.

2. Karpova O. V. Monitoring of forest fires // Technogenic and natural safety: Materials II All-Russian. – 2013.

3. Davletshina I. R, Storozhenko L. A. The use of remote sensing data to provide operational monitoring of forest fires // Collected papers of the international scientific and practical conference "Ural Mining School to Regions": URSMU. – Ekaterinburg. 2016.

4. Storozhenko L. A, Martynenko M. S. Organization of a database in electronic formats of geoinformation systems // The collection: Sergeevsky readings. Sustainable development: tasks of geoecology (engineering-geological, hydro-geological and geocryological aspects) Youth conference. Materials of the annual session of the Scientific Council of the Russian Academy of Sciences on the problems of geoecology,

engineering geology and hydrogeology, Moscow, March 22-23, 2013. – M: PFUR. – Moscow. – 2013.